Patent Claims

1. A sensor arrangement (10) for detecting radiation having a layer sequence which contains, in the order indicated:

a holding substrate (50) which is permeable to the detectable radiation, at least in regions, or produces detectable radiation when radiation impinges and which holds a plurality of detection elements (12a, 12b) in the sensor arrangement (10),

at least one auxiliary layer (22) which is permeable to the detectable radiation and extends continuously over a plurality of detection elements (12a, 12b) or which contains separate regions (22a, 22b) which are respectively associated with a detection element (12a, 12b),

a detection layer (24) with separate detection regions (24a, 24b) which are contained in a detection element (12a, 12b) and respectively contain at least one semiconductor component (28b) which is sensitive to the detectable radiation,

and an insulating layer (40) with separate insulating regions (40b) for electrically insulating the detection regions (24b) from a point of contact having electrically conductive connections (36).

2. The sensor arrangement (10) as claimed in claim 1, characterized in that the holding substrate (50) contains regions (54a, 54b) which are permeable to the detectable radiation and are respectively contained in a detection element (12a, 12b), and

in that the holding substrate (50) contains, between the detection elements (12a, 12b), regions which absorb or reflect the detectable radiation.

3. The sensor arrangement (10) as claimed in claim 1 or 2, characterized in that the holding substrate (50) contains a material which converts impinging particle radiation or radiation which is high in energy as compared with the detectable radiation into the detectable radiation,

and/or in that the holding substrate (50) contains material which converts X-ray radiation into radiation which can be detected with a pin diode (28b), preferably a highly absorbent semiconductor material or CdZnTe or PbO, or GaO sulfide.

4. The sensor arrangement (10) as claimed in one of the preceding claims, characterized
in that the regions (22a, 22b) of the auxiliary layer (22) and/or the detection regions (24a, 24b) and/or the insulating regions (40a, 40b) are separated by a filling material (80),

and/or in that the filling material (80) is a plastic, preferably an epoxy resin,

and/or in that the filling material (80) has been mixed with a material which absorbs or reflects the detectable radiation, preferably with titanium dioxide.

5. The sensor arrangement (10) as claimed in one of the preceding claims, characterized
in that the auxiliary layer (22) is a glass layer or a ceramic layer,

and/or in that the insulating layer (40) is a glass layer,

and/or in that the detection layer (24) contains a semiconductor support material, preferably a silicon material and/or a thinned silicon material,

and/or in that the point of contact contains solder material (36).

6. The sensor arrangement (10) as claimed in one of the preceding claims, characterized
in that a detection area on the detection elements (12a, 12b) is smaller than five square millimeters or smaller than one square millimeter,

and/or in that the sensor arrangement (10) contains more than two hundred detection elements (12a, 12b).

7. The sensor arrangement (10) as claimed in one of the preceding claims, characterized
in that the semiconductor components (28a, 28b) contains a doped region of one conduction type, a doped region of another conduction type and, between these regions, an intermediate region which is undoped or is provided with a weak doping as compared with the doping of the other regions.

8. A computer tomograph,

having a radiation transmission unit for emitting radiation, preferably X-ray radiation,

having a detection unit (10) for detecting the emitted radiation following the passage through a tissue which influences the radiation intensity,

and having an evaluation unit which takes the output signals from the detection unit as the basis for producing image data for an image of the structure of the tissue,

characterized in that the detection unit contains a sensor arrangement (10) as claimed in one of the preceding claims.

9. A method for manufacturing a sensor arrangement (10),

in which the following steps are performed without any limitation by the order indicated:

a large number of integrated radiation-sensitive semiconductor components (28a, 28b) are manufactured starting from a support substrate (100) made of semiconductor material of an initial thickness (D1),

the support substrate (100) and an auxiliary substrate (22) are mechanically connected on one side of the support substrate, which side contains radiation-sensitive areas of the semiconductor components (28a, 28b),

the support substrate (100) is thinned on the bare side to a thickness (D2) which is less than the initial thickness (D1),

the free side of the support substrate (100) is mechanically connected to an insulating substrate (40),

pads (108 to 114) are put on the free side of the insulating substrate (40),

the insulating substrate is separated at the boundaries between individual semiconductor boards having a large number of semiconductor components (28a, 28b) and/or at the boundaries between individual semiconductor components (28b, 28b), with the auxiliary substrate (22) not being separated,

the pads (108 to 114) are electrically connected to connecting points (104) which lead to the semiconductor components (28a, 28b),

the auxiliary substrate (22) and a holding substrate (50) are mechanically connected on the bare side of the auxiliary substrate (22),

the auxiliary substrate (22) is separated at the boundaries between individual semiconductor boards and/or individual semiconductor components (28a, 28b), with the auxiliary substrate (50) not being separated.

10. The method as claimed in claim 9, characterized by the following step:

the thinned support substrate (100) is separated at the boundaries between individual semiconductor boards having a large number of semiconductor components (28a, 28b) and/or the boundaries between individual semiconductor components (28a, 28b), with the auxiliary substrate (22) not being separated and with at least one interconnect in a metallization layer of the semiconductor components (28a, 28b) being exposed at a connecting point (104),

the thinned support substrate (100) preferably being separated before the free side of the support substrate (100) is mechanically connected to the insulating substrate (40).

11. The method as claimed in claim 9 or 10, characterized by the following step:

the separation point (120) is filled with a filling material (80).

12. The method as claimed in one of claims 9 to 11, characterized in that it is used to manufacture a sensor arrangement (10) as claimed in one of claims 1 to 8.